

# OMEGA-3 SUPPORTS HEALTHY IMMUNE RESPONSE



## Diet and the Immune Response

**We are what we eat!** Dietary fats are used to construct every cell in the body. Cell membranes are made from fatty acids and serve as a protective barrier for each and every cell. They protect the cell from its surroundings while facilitating cell-to-cell communication. Cell membranes also serve as a reservoir for fatty acids. This reservoir of fatty acids provides precursors to powerful hormone-like molecules that drive the body's immune response and can promote anti-inflammatory activity.



## The Standard American Diet High in OMEGA-6

The Standard American Diet is rich in saturated fats, trans fatty acids, and arachidonic acid. Saturated fats and trans fatty acids result in stiffer, non-permeable cell membranes, which reduce cell communication and limit adequate transport of nutrients into a cell. Arachidonic acid is an Omega-6 fatty acid found primarily in meat and dairy. Arachidonic acid is the precursor to immune molecules that create inflammation and can contribute to chronic inflammatory diseases such as heart disease.

## Diet high in Essential Fatty Acids Rich in OMEGA-3 and GLA

Omega-3 fatty acids are considered Essential Fatty Acids (EFAs) because they cannot be produced in the human body and therefore they must be obtained from the diet. Omega-3 fatty acids from fish are a direct source of EPA and DHA, two fatty acids vital for proper cellular function. EPA and GLA are precursors to immune molecules that promote a positive immune response and are the body's strongest inflammation-reducing compounds. The American Heart Association recommends the consumption of Omega-3 fatty acids to reduce risk factors associated with heart disease including hypertension, high triglycerides, and atherosclerosis. Omega-3 fatty acids also reduce the risk of sudden cardiac death.

## Immune System Triggers



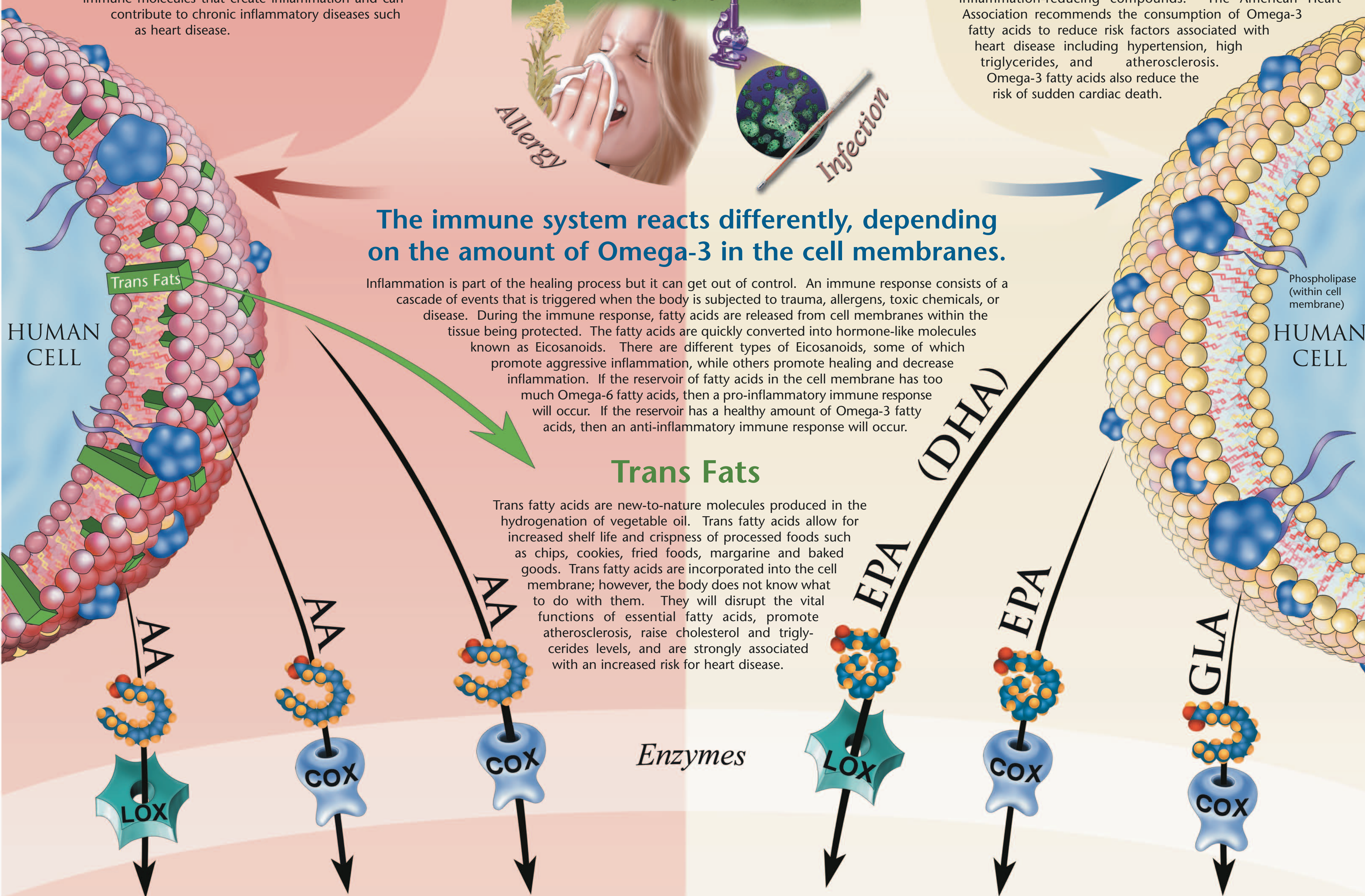
## The immune system reacts differently, depending on the amount of Omega-3 in the cell membranes.

Inflammation is part of the healing process but it can get out of control. An immune response consists of a cascade of events that is triggered when the body is subjected to trauma, allergens, toxic chemicals, or disease. During the immune response, fatty acids are released from cell membranes within the tissue being protected. The fatty acids are quickly converted into hormone-like molecules known as Eicosanoids. There are different types of Eicosanoids, some of which promote aggressive inflammation, while others promote healing and decrease inflammation. If the reservoir of fatty acids in the cell membrane has too much Omega-6 fatty acids, then a pro-inflammatory immune response will occur. If the reservoir has a healthy amount of Omega-3 fatty acids, then an anti-inflammatory immune response will occur.

## Trans Fats

Trans fatty acids are new-to-nature molecules produced in the hydrogenation of vegetable oil. Trans fatty acids allow for increased shelf life and crispness of processed foods such as chips, cookies, fried foods, margarine and baked goods. Trans fatty acids are incorporated into the cell membrane; however, the body does not know what to do with them. They will disrupt the vital functions of essential fatty acids, promote atherosclerosis, raise cholesterol and triglyceride levels, and are strongly associated with an increased risk for heart disease.

## Enzymes



## LTB-4

### Leukotrienes-4 series

- Promotes inflammation
- Constricts airways
- Prolongs duration of inflammation

## TXA-2

### Thromboxane-A2

- Constricts blood vessels
- Constricts airways
- Increases blood clotting
- Reduces circulation

## PGE-2

### Prostaglandin-E2

- Increases sensitivity to pain
- Increases swelling
- Induces fever
- Constricts blood vessels

## LTB-5

### Leukotriene-5 series

- Relaxes blood vessels
- Increases circulation
- Relaxes airways
- Promotes anti-inflammatory response

## PGE-3

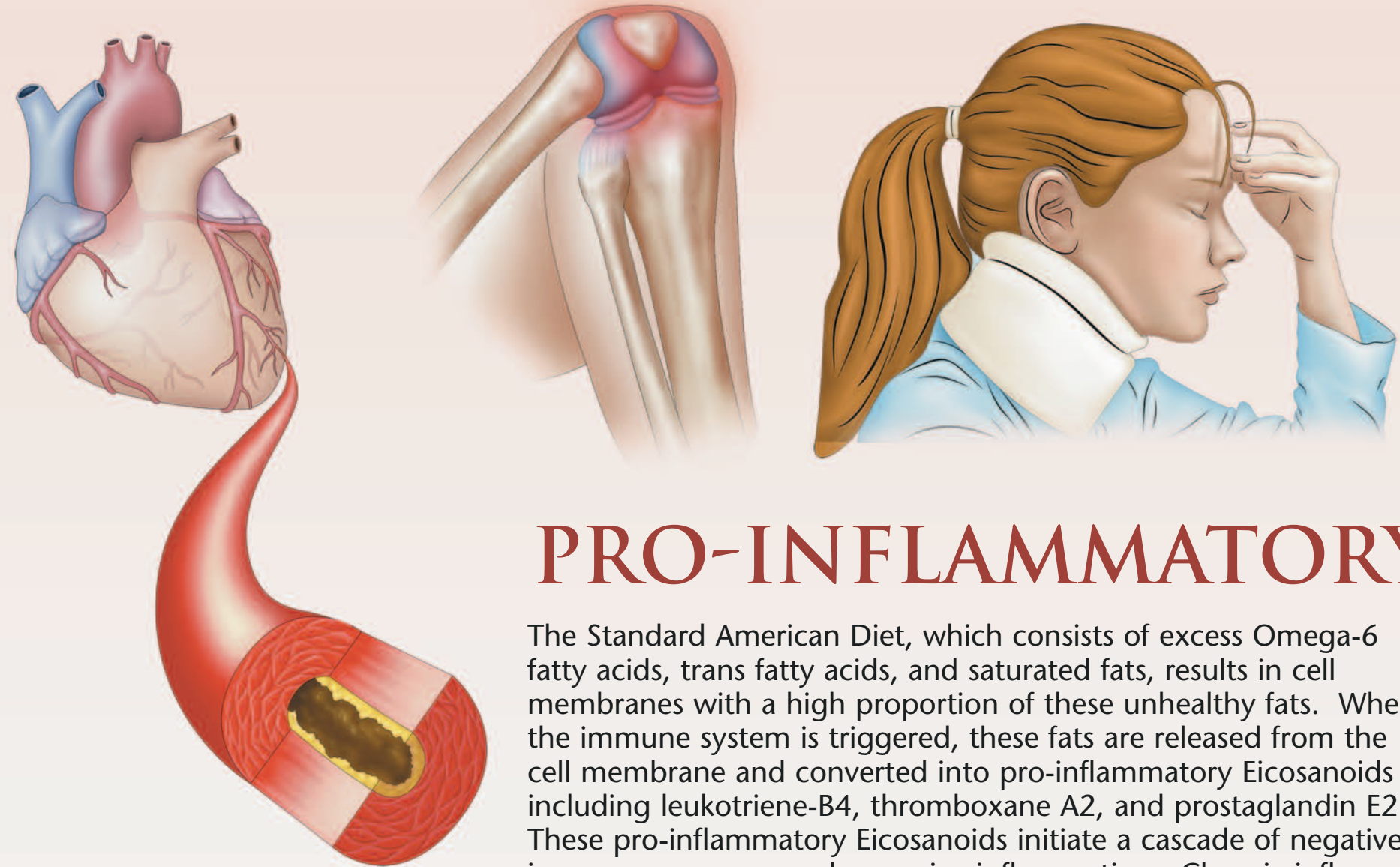
### Prostaglandin-E3

- Improves circulation
- Decreases sensitivity to pain
- Relaxes blood vessels
- Promotes anti-inflammatory response

## PGE-1

### Prostaglandin-E1

- Relaxes muscles spasms
- Reduces blood clotting
- Increases protective stomach secretions
- Improves circulation



## PRO-INFLAMMATORY

The Standard American Diet, which consists of excess Omega-6 fatty acids, trans fatty acids, and saturated fats, results in cell membranes with a high proportion of these unhealthy fats. When the immune system is triggered, these fats are released from the cell membrane and converted into pro-inflammatory Eicosanoids including leukotriene-B4, thromboxane A2, and prostaglandin E2. These pro-inflammatory Eicosanoids initiate a cascade of negative immune responses and excessive inflammation. Chronic inflammation is directly related to most degenerative diseases.



## ANTI-INFLAMMATORY

A healthy whole foods diet rich in Omega-3 fatty acids from fish and fish oil results in a cell membrane with a high proportion of healthy fatty acids. When the immune system is triggered, EPA and DHA are released from the cell membrane and converted into anti-inflammatory Eicosanoids including leukotriene-B5 and prostaglandin E3. These anti-inflammatory Eicosanoids initiate a cascade of beneficial immune effects and reduce the overall inflammatory response. Daily consumption of Omega-3 fatty acids is associated with a reduced risk for many chronic diseases and is recommended in the current Dietary Guidelines for Americans published by the Department of Health and Human Services and the USDA.



AA: Arachidonic Acid  
 DHA: Docosahexaenoic Acid  
 EPA: Eicosapentaenoic Acid  
 GLA: Gamma Linolenic Acid